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**METER STAND**

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## **METER STAND**

### **Field of the Invention**

**[0001]** The present invention relates to a meter stand for holding a meter, such a multi-meter, and more particularly relates to a meter stand having an arm assembly that is detachable from a base member.

### **Background of the Invention**

**[0002]** Portable meters, such as a common handheld multi-meter, are used in various environments and for various purposes. When using a multi-meter to measure voltage, current, and/or resistance, a user typically places the multi-meter on a table top, the ground, or some other horizontal flat surface such that his hands are free to grasp the two electronic probes of the multi-meter. However, many environments have few if any horizontal flat surfaces on which the multi-meter may be placed during use. Thus, the multi-meter may be placed in a location where the display of the multi-meter is not easily readable by the user. Further, in environments where the only horizontal flat surfaces would place the nodes of interest beyond the reach of the two electronic probes, the user is typically forced to attempt to hold the meter while manipulating the two electronic probes with her two hands.

**[0003]** There are also environments in which the user must frequently move the multi-meter to monitor various nodes of a device or a piece of machinery. In these environments, the user must either repeatedly move the multi-meter from one horizontal flat surface to another horizontal flat surface such that the multi-meter is near the nodes of interest, or attempt to hold the multi-meter in some fashion while manipulating the two electronic probes. Further, even if the user is able to hold the meter and manipulate the probes at the same time, he may not be able to easily read the display of the multi-meter or change the settings or mode of operation of the multi-meter.

**[0004]** Thus, there remains a need for a meter stand for holding a meter that is capable of supporting a meter in various environments.

### **Summary of the Invention**

**[0005]** The present invention provides a meter stand for holding a meter such as a multi-meter. In general, the meter stand includes an arm assembly detachably connected to a base member having a first socket attachment. The arm assembly includes a meter attachment assembly for holding the meter, a first arm attached to the meter attachment assembly, and a second arm hingedly connected to the first arm and having a second socket attachment that detachably connects the arm assembly to the base member.

**[0006]** In one embodiment, the meter stand includes the arm assembly and a magnetic base member. The magnetic base member includes the first socket attachment for detachably connecting to the arm assembly. The magnetic base member may also include a third socket attachment to which the arm assembly may be detachably connected if so desired. In operation, the magnetic base member magnetically attaches the meter stand to a metallic surface.

**[0007]** In another embodiment, the meter stand includes the arm assembly detachably connected to a clamp assembly, which operates as the base member. In one embodiment, the clamp assembly includes the magnetic base member and a clamp body detachably connected to the magnetic base member. In another embodiment, the clamp assembly includes a clamp body that is detachably connected to the arm assembly. In operation, either embodiment of the clamp assembly attaches the meter stand to a thin, flat surface such as a table top.

**[0008]** In yet another embodiment, the meter stand includes the arm assembly detachably connected to a stand assembly. The stand assembly includes an arm hingedly connected to two support members. The arm includes a first end having a socket attachment for detachably connecting to the arm assembly and a second end hingedly connected to the two support members. The meter stand may further include a neck strap and a waist strap that connect to orifices in the first and second support members and that attach the meter stand to a user's body. Additionally, the meter stand may be attached to a wall by driving nails into a wall through one or more of the orifices in the first and second support members.

**[0009]** Those skilled in the art will appreciate the scope of the present invention and realize additional aspects thereof after reading the following detailed description of the preferred embodiments in association with the accompanying drawing figures.

### **Brief Description of the Drawings**

- [0010]** The accompanying drawing figures incorporated in and forming a part of this specification illustrate several aspects of the invention, and together with the description serve to explain the principles of the invention.
- [0011]** Figure 1 illustrates an arm assembly of a meter stand holding a meter according to one embodiment of the present invention;
- [0012]** Figure 2 illustrates the arm assembly of Figure 1 without the meter;
- [0013]** Figure 3 is a rear view of the arm assembly of Figure 2;
- [0014]** Figure 4 is an exploded view of the arm assembly of Figure 2;
- [0015]** Figure 5 is an alternate embodiment of the arm assembly of Figure 3 wherein the arm assembly includes a bolt for hingedly connecting the first arm to the second arm according to one embodiment of the present invention;
- [0016]** Figure 6 illustrates the meter stand of Figure 2 having a magnetic base according to one embodiment of the present invention;
- [0017]** Figure 7 illustrates the meter stand attached to a vertical surface;
- [0018]** Figure 8 illustrates a meter stand having a clamp assembly as a base member according to one embodiment of the present invention;
- [0019]** Figure 9 illustrates an alternative embodiment of the meter stand of Figure 8;
- [0020]** Figure 10 illustrates a meter stand having a stand assembly as a base member according to one embodiment of the present invention;
- [0021]** Figure 11 illustrates the meter stand of Figure 10 including a neck strap and a waist strap according to one embodiment of the present invention;
- [0022]** Figure 12 illustrates the meter stand of Figure 10 attached to a vertical surface according to one embodiment of the present invention;
- [0023]** Figure 13 illustrates the meter stand in a substantially flat folded position according to one embodiment of the present invention; and
- [0024]** Figure 14 illustrates an alternative embodiment of the socket attachments of the meter stand of the present invention.

### **Detailed Description of the Preferred Embodiments**

**[0025]** The embodiments set forth below represent the necessary information to enable those skilled in the art to practice the invention and illustrate the best mode of practicing the invention. Upon reading the following description in light of the accompanying drawing figures, those skilled in the art will understand the concepts of the invention and will recognize applications of these concepts not particularly addressed herein. It should be understood that these concepts and applications fall within the scope of the disclosure and the accompanying claims.

**[0026]** Figure 1 illustrates an arm assembly 10 of a meter stand according to one embodiment of the present invention. The arm assembly 10 includes a meter attachment assembly 12 for holding a meter 14, such as a multi-meter, voltmeter, or the like. As illustrated in Figure 2, the meter attachment assembly 12 includes three slotted members 16-20. The first slotted member 16 includes a first portion 16A having a slot 16B and a second portion having a tab 16C that is substantially perpendicular to the first portion 16A. The second slotted member 18 includes a first portion 18A having a slot 18B and a second portion having a tab 18C that is substantially perpendicular to the first portion 16A. Similarly, the third slotted member 20 includes a first portion 20A having a slot 20B and a second portion having a tab 20C that is substantially perpendicular to the first portion 20A.

**[0027]** The slotted members 16-20 are arranged such that a bolt 22 passes through each of the slots 16B-20B of the slotted members 16-20. The slotted members 16-20 are positioned about the bolt 22 such that the slot 16B of the first slotted member 16 overlaps the slot 18B of the second slotted member 18 and the tab 16C of the first slotted member 16 is horizontally across from the tab 18C of the second slotted member 18. The third slotted member 20 is arranged such that the slot 20B of the third slotted member 20 intersects the slots 16B and 18B and the first portion 20A of the third slotted member 20 is substantially perpendicular to the first portions 16A and 18A of the first slotted member 16 and the second slotted member 18, respectively.

**[0028]** As illustrated in Figure 3, which is a rear view of Figure 2, the bolt 22 passes through the slots 16B-20B, and the meter attachment assembly 12

is secured to a first arm 24 of the arm assembly 10 by securing a wing nut 25 onto the bolt 22. The bolt 22 and the wing nut 25 form a fastener and may be replaced by any type of fastener that can hold the slotted members 16-20 together and attach the meter attachment assembly to the first arm 24. The arm assembly 10 also includes a second arm 26 hingedly connected to the first arm 24. In the illustrated embodiment, the second arm 26 includes a bolt 28 (Figure 4) that passes through an orifice 30 (Figure 4) in the first arm 24. A second wing nut 32 is secured to the bolt 28, thereby forming a fastener that hingedly connects the first arm 24 to the second arm 26. The second arm 26 also includes a socket attachment 34 whose function is described in detail below. Although the socket attachment 34 is illustrated as a female socket attachment, it should be noted that that socket attachment may alternatively be a male socket attachment.

**[0029]** Both the meter attachment assembly 12 and the relative positions of the first arm 24 and the second arm 26 are adjustable. The meter attachment assembly 12 is adjustable by loosening the wing nut 25 such that the meter attachment assembly 12 is in an unlocked state. Once in the unlocked state, the slotted members 16-20 are free so slide about the bolt 22. For example, a width of the meter attachment assembly 12, which is a distance between the tabs 16C and 18C, can be adjusted by sliding the first and second slotted members 16 and 18 such that the tabs 16C and 18C either move toward one another or away from one another. Further, the third slotted member 20 is free to slide vertically to either increase or decrease a distance between the tab 20C of the third slotted member 20 and the first and second slotted members 16 and 18, thereby adjusting a height of the meter attachment assembly 12. Further, the first and second slotted members 16 and 18 can be rotated about the bolt 22 such that the tabs 16C and 18C are either angled up or down in order to accommodate meters having tops that are wider than their bases or vice versa. Once the slotted members 16-20 are adjusted, the wing nut 25 is tightened such that the meter attachment assembly 12 is in a locked state and forms a substantially rigid structure.

**[0030]** The position of the first arm 24 relative to the position of the second arm 26 can be adjusted in a similar fashion. First, the arms 24 and 26 are placed in an unlocked state by loosening the second wing nut 32. Once in the

unlocked state, the first and second arms 24 and 26 are free to hingedly rotate about the bolt 28 (Figure 4). Once the arms 24 and 26 are in a desired position, the arms 24 and 26 are placed in a locked state by tightening the wing nut 32 such that the arms 24 and 26 form a substantially rigid structure.

**[0031]** Figure 4 is an exploded view of the arm assembly 10 of Figures 1-3 illustrating that the elements of the arm assembly 10 can be disassembled from one another. As discussed above, the arm assembly 10 includes the meter attachment assembly 12 including the slotted members 16-20. The first slotted member 16 includes the first portion 16A having the slot 16B and also includes the tab 16C that is substantially perpendicular to the first portion 16A. In a similar fashion, each of the second and third slotted members 18 and 20 include the first portions 18A and 20A having the slots 18B and 20C and also having the perpendicular tabs 18C and 20C. The slotted members 16-20 are attached to the first arm 24 via the bolt 22 that passes through the slots 16B-20B and through an orifice 36 in the first arm 24. The wing nut 25 secures to the bolt 22 and is used to lock or unlock the slotted members 16-20, as discussed above. The second arm 26 includes the bolt 28 that passes through the orifice 30 in the first arm 24, thereby hingedly connecting the first arm 24 to the second arm 26. The wing nut 32 secures to the bolt 28 and is used to lock or unlock the arms 24 and 26, as discussed above.

**[0032]** Figure 5 illustrates an alternative embodiment of the arm assembly 10 of Figures 1-4. In this embodiment, the first arm 24, rather than the second arm 24, includes the bolt 28. The previous discussion in Figures 1-4 is applicable for Figure 5.

**[0033]** As illustrated in Figures 1-5, the second arm 26 of the arm assembly 10 includes the socket attachment 34. As is discussed below in detail, the socket attachment 34 allows the arm assembly 10 to be detachably connected to various base members designed to support the arm assembly in various environments. Further, the socket attachment 34 allows the arm assembly 12 to quickly and easily be attached or detached from the base members.

**[0034]** Figure 6 illustrates a one embodiment of a meter stand 38 according to the present invention. The meter stand 38 includes the arm assembly 10 detachably connected to a magnetic base member 40. The arm

assembly 10 is as described above with respect to Figures 1-5. The magnetic base member 40 is magnetic such that the base member 40, and thus the meter stand 38, can be attached to a metal surface (not shown) using the magnetic force of the magnetic base member 40. The magnetic base member 40 includes a first socket attachment 42 and optionally a second socket attachment 44. In the illustrated embodiment, the socket attachments 42 and 44 are male socket attachments and may include spring loaded balls 46 and 48 to provide a more secure connection when inserted into a female socket attachment.

**[0035]** The arm assembly 10 is detachably connected to the magnetic base member 40 by attaching the female socket attachment 34 to one of the male socket attachments 42 or 44. Because of the socket attachments 34, 42 and 44, the arm assembly 10 can be quickly and easily attached or detached from the magnetic base member 40. As illustrated, the female socket attachment 34 is detachably connected to the male socket attachment 42. Although the socket attachment 34 is illustrated as a female socket attachment and the socket attachments 42 and 44 are illustrated as male socket attachments, it should be noted that the socket attachment 34 may alternatively be a male socket attachment and the socket attachments 40 and 42 may alternatively be female socket attachments.

**[0036]** Figure 7 illustrates the meter stand 38 having the magnetic base member 40 attached to a vertical surface 50, such as metallic wall. As illustrated the arm assembly 10 is adjusted such that the meter attachment assembly 12 faces outward and slightly upward from the vertical surface 50. However, it should be noted that the arm assembly 10 can be adjusted, as discussed above, such that the meter attachment assembly 12 faces in a desired direction. Although the arm assembly 10 is illustrated as being detachably connected to the socket attachment 42, the arm assembly 10 may alternatively be attached to the socket attachment 44 if so desired.

**[0037]** Figure 8 illustrates another embodiment of the meter stand 38' including the arm assembly 10 of Figures 1-5 and a clamp assembly 52 operating as a base member. The clamp assembly 52 is detachably connected to the arm assembly 10 and operates to connect the meter stand 38' to a thin surface 54 such as a table top. For instance, it may be desirable



to use the meter stand 38' in an environment having no metal surfaces on which the magnetic base member 40 can be attached and the only available surface is a thin surface such as a table top. It should be noted that the surface 54 need not be horizontal or completely flat. For example, the clamp assembly 52 can be attached to a door or a vertical column post in addition to structures such as a table top.

**[0038]** The clamp assembly 52 includes the magnetic base member 40 of Figures 6 and 7 and a clamp body 56. The clamp body 56 includes a c-shaped portion 58 and a threaded bolt 60. At one end of the threaded bolt 60 there may be a bar 62 which allows the threaded bolt 60 to be easily rotated. The arm assembly 10 is detachably connected to the magnetic base member 40 via socket attachments 34 and 42, and the magnetic base member 40 is detachably connected to the clamp body 56 via socket attachment 42 and a socket attachment 64 at one end of the c-shaped portion 58 of the clamp body 56. The meter stand 38' is attached to the surface 54 by placing the clamp assembly 52 such that the bottom surface of the magnetic base member 40 rests on the upper surface of the thin, flat surface 54. The clamp assembly 52, and thus the meter stand 38', is secured to the surface 54 by rotating the threaded bolt 60 until the end of the threaded bolt 60 comes into contact with the bottom surface of the thin, flat surface 54.

**[0039]** Although Figure 8 illustrates that the clamp assembly 52 includes the magnetic base member 40, the magnetic base member 40 may be replaced with any similar structure having two socket attachments. Further, the magnetic base member 40 may be replaced with a similar structure that is non-magnetic.

**[0040]** Figure 9 illustrates an alternative embodiment of the meter stand 38' of Figure 8. In this embodiment, the clamp assembly 52 includes an alternative embodiment of the clamp body 56'. In this embodiment, the clamp body 56' includes the c-shaped portion 58' and the threaded bolt 60. At one end of the threaded bolt 60 there may be the bar 62 which allows the threaded bolt 60 to be easily rotated. In this embodiment, the c-shaped portion 58' includes a socket attachment 64. Thus, unlike the embodiment illustrated in Figure 8, the clamp assembly 52 of Figure 9 does not include the

magnetic base member 40. Thus, the arm assembly 10 is directly attached to the clamp assembly 52 via the socket attachments 34 and 64.

**[0041]** Figure 10 illustrates another embodiment of the meter stand 38" including the arm assembly 10 of Figures 1-5 detachably connected to a stand assembly 66, which operates as a base member. The stand assembly 66 includes an arm 68 and support members 70 and 72. The arm 68 and the support members 70 and 72 are hingedly connected as illustrated by a bolt 74 and corresponding wing nut 76, where the bolt 74 and the wing nut 76 form a fastener. Also, the first support member 70 includes orifices 78 and 80, and the second support member 72 includes orifices 82 and 84.

**[0042]** In operation, the stand assembly 66 is placed in an unlocked state by loosening the wing nut 74. Once in the unlocked state, the arm 68 and the support members 70 and 72 are free to hingedly rotate with respect to one another. For example, the support members 70 and 72 can be rotated such that the support members 70 are spread apart and form a stable base for the meter stand 38". The arm 68 can be hingedly rotated such that the arm assembly 10 is in a desired position. Once the arm 68 and the support members 70 and 72 are in their desired positions, the wing nut 74 can be tightened to place the stand assembly 66 in a locked state such that the arm 68 and the support members 70 and 72 form a substantially rigid structure.

**[0043]** Once the stand assembly 66 is adjusted, the meter stand 38" operates as a meter stand that can be placed on a surface to hold a meter. As shown, the support members 70 and 72 are preferably adjusted such that the support members 70 and 72 form a bi-pod structure. It may be desirable to use the meter stand 38" including the stand assembly 66 in any environment having a substantially flat surface that is large enough to accommodate the stand assembly. Further, the meter stand 38" is easily movable.

**[0044]** As illustrated in Figure 11, the meter stand 38" may also be used in conjunction with a neck strap 86 and optionally a waist strap 88 to support the meter stand 38" around a user's neck. One end of the neck strap 86 is connected to the meter stand 38" via the orifice 78 in the first support member 70, and the other end of the neck strap 86 is connected to the meter stand 38" via the orifice 80 in the first support member 70. Similarly, the waist strap

88 may be connected to the meter stand 38" via the orifices 82 and 84 to further stabilize the meter stand 38". Both the neck strap 86 and the waist strap 88 may be adjustable to accommodate users of varying sizes and to allow the user the position the meter stand 38" at a desirable location on his body.

**[0045]** Figure 12 illustrates that the meter stand 38" of Figure 10 may also be hung on a vertical surface 90 using nails 92 or similar attachment means. The nails 92 are positioned such that the meter stand 38" may be secured to the vertical surface 90 by inserting the nails to either the orifices 78 and 80 in the first support member 70 or the orifices 82 and 84 in the second support member. As illustrated, the nails 92 pass through each of the orifices 78-84. However, it should be noted that in one embodiment the meter stand 38" may be hung by only the nails 92 through the orifices 78 and 80. In yet another embodiment, the meter stand 38" may be rotated and hung using the nails 92 through the orifices 82 and 84 or the nails 92 through all of the orifices 78-84.

**[0046]** Figure 13 illustrates the meter stand 38" of Figure 10 in a folded position where the meter stand 38" is substantially flat. When in the folded position, the first and second support members 70 and 72 and the arm 68 are arranged as illustrated. In general, the first support member 70 folds into the second support member 72, and the arm 68 folds into the first and second support members 70 and 72. The ability of the meter stand 38" to be folded into the folded position allows the meter stand 38" to be easily stored.

**[0047]** Figure 14 illustrates an alternative embodiment of the socket attachment 34, wherein the socket attachment 34 includes a ball-joint 94 that couples the socket attachment 34 to the arm 26. The ball-joint 94 allows the arm 26 to freely pivot about the ball-joint in any direction. Although Figure 15 illustrates the socket attachment 34 having the ball-joint 94, it should be noted that any of the socket attachments of Figures 1-14 may be alternatively replaced by a socket attachment including a ball-join 94.

**[0048]** Those skilled in the art will recognize improvements and modifications to the preferred embodiments of the present invention. All such improvements and modifications are considered within the scope of the concepts disclosed herein and the claims that follow.